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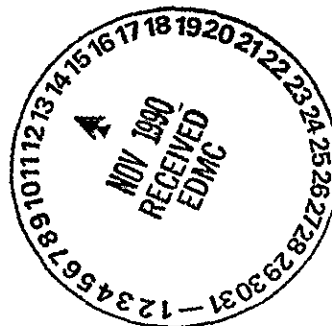
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The Status of Persistentsepal Yellowcress in Washington

Abstract

The infrequently collected yellowcress *Rorippa columbiae* is abundant along the Hanford Reach of the Columbia River in south central Washington. A review of herbarium specimens suggests that the plants at the three known sites (south central Oregon; Columbia River, Washington; and Lava Beds National Monument, California) may be morphologically distinct. While the taxon appears to be abundant in Washington, more research is needed to clarify its status and to determine its present geographic distribution.

Introduction

During an environmental survey of the potential disturbances from construction and operation of a nuclear power plant on the Hanford Site in south central Washington, it was discovered that a taxon of yellowcress growing along the Columbia River near the proposed construction site was on the Washington Natural Heritage Program list (1982) of endangered species and was also a candidate species for Federal Listing, Category 2, United States Fish and Wildlife Service (*Federal Register* 45:82480-82569, 15 December 1982). This species, *Rorippa calycina* (Engelm.) Rydb. var. *columbiae* (Suksd. ex Robins) Rollins (see literature review below), a member of the Cruciferae, is a rhizomatous perennial with weakly ascending to erect stems, finely hirsute pinnatifid leaves, light yellow flowers, and oblong siliques. The known specimens are from only four general locations. This paper reports the present distribution of *Rorippa columbiae*, in Washington, with comments on its taxonomy and ecological and morphologic variation.

Literature Review and Herbarium Records

Stuckey (1972) determined that *Rorippa calycina* var. *columbiae* Rollins is *R. columbiae* (Robbins) Howell based on fruit and flower pubescence and geographic distribution. Stuckey determined that the herbarium specimens from Montana, Nebraska and New Mexico are *R. calycina* and that the specimens from Washington, Oregon and California are *R. columbiae*. He also suggests that *R. columbiae* is a very old taxon that is restricted to the Columbia River basaltic plateau region of the Pacific Northwest.

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Few collections of this plant are available. One specimen on file at the University of Washington herbarium (#5068), dated 19 May 1905, was collected by W. N. Suksdorf on the Columbia River near Bingen in Klickitat County. The Bingen specimens were collected "along the shore of the Columbia River," a site now almost certainly covered by the 48-mile-long pool behind Bonneville Dam. Stuckey (1972) was unable to relocate the species in the Bingen area in 1963. It is assumed that the original collection site and habitat were inundated by the approximately 30-ft rise in river water level at Bingen following completion of Bonneville Dam in 1938 (Jeff Hansen, U.S. Army Corps of Engineers, personal communication).

Seven specimens identified as *R. calycina* var. *columbiae* are on file at the Washington State University herbarium. Four of the specimens are from Washington; three were collected in the 1890's near Bingen by W. N. Suksdorf [#952 (type specimen, two sheets) and #5068], and one was collected in 1953 on the Hanford Reservation by J. J. Davis (#150). Three of the specimens are from Oregon; all were collected from Klamath County and dated 1901 (W. C. Cusick, #2717), 1951 (L. Constance, E. Molseed, and J. Weiler, #3680) and unknown (H. B. Schieferstein, no number). The final specimen is from California and was collected by J. W. Thompson (#13148) in the Lava Beds National Monument in Siskiyou County in 1936.

Four specimens are in the Battelle-Northwest ALE herbarium: two are dated 11 August 1953 and were collected on the Benton County side of the Hanford Reach near River Mile 365, and two are dated 8 August 1980 and were collected at the Hanford 100F gravel bar. No specimens were found at other likely herbaria, including Central Washington State University (Dr. William Barker, personal communication); Oregon State University (Dr. Kenton Chambers, personal communication); University of California at Riverside (Dr. Frank Vasek, personal communication); University of California at Los Angeles (David Verede, personal communication); and Lava Beds National Monument, Tule Lake, California (Gary Hathaway, personal communication). Also, this species was not included in a flora of Lava Beds National Monument compiled from 1936 to 1938 (Applegate 1938).

Field Observations

A field survey of the Hanford Reach and surrounding areas was made to document or verify the occurrence and extent of the distribution of *R. columbiae* in the vicinity of the proposed Skagit/Hanford Nuclear Project intake/discharge (River Mile 361.5). A second objective of the study was to identify and describe qualitatively the habitat in which the species occurs and the timing of its emergence relative to fluctuating river levels.

The yearly appearance of *R. columbiae* on the Hanford Reach during the growing season is dependent upon exposure of the appropriate habitat, which occurs when flows from upstream dams are reduced to less than approximately 100,000 cubic feet per second (cfs). Discharge from Priest Rapids Dam, the first dam upstream of the Hanford Reach, remained well above 100,000 cfs until late August 1982 (Dispatch Office, Grant County PUD, personal communication). Earlier inspections of the shoreline downstream of the dam revealed no suitable habitat. Flows at or less than 100,000 cfs occurred regularly beginning 23 August 1982.

The Benton County side of the Columbia River from River Mile 360 to 362 was inspected on 27 August and then weekly from 10 September through 8 October, and 22 October through 5 November 1982, to locate *R. columbiae* and to identify and note the extent of its habitat. Field observations were also made on 1 October 1982 on the Franklin County shoreline and at islands from River Mile 345 to River Mile 362 on the Benton County side from River Mile 364 to 365, and on the Grant County side at Vernita Bridge and Vernita Bar. On the same day, the east bank of the Columbia River at Sentinel Gap and Crab Creek, and the South Bank of the Snake River about one mile downstream from Ice Harbor Dam were inspected.

Results and Discussion

The field studies indicate that *R. columbiae* is common along the Hanford Reach (Figure 1). The species was observed on both banks of the river and on islands near River Mile 345 upriver to River Mile 362. *Rorippa columbiae* was observed on the Benton County side from River Mile 364 to 365 and in the vicinity of the Vernita Bridge on the Grant County side. No *Rorippa columbiae* was found at the Sentinel Gap, Crab Creek, or Snake River near Ice Harbor Dam sites.

The plants were observed in the vegetative stage in mid-September. The first flowers were observed on 24 September, and one plant was found in fruit on 29 October. The species was always found at or near the lower edge of the vegetated zone on the river bank where vegetation cover is generally sparse. The preferred habitat seems to be gently sloping gravel banks with wet silty soil beneath a layer of gravel. The gravel size is usually less than about 7 cm, although some plants were found among stones as large as 40 cm.

An important aspect of the habitat is the water level, which changes on a daily and seasonal basis. After late August 1982, the habitat was more or less continuously exposed. The presence of the species in previously flooded areas indicates it survives long periods of inundation. Before dams were built on the Columbia River, the water level probably decreased slowly during the summer, which gradually exposed the *R. columbiae* habitat and provided moist substrate early enough in the season to allow the species to flower and fruit before fall. Presently, water levels between Priest Rapids and McNary dams fluctuate as much as 2 m in a single day, resulting in frequent inundation. In addition, operation of these dams delays the seasonal drop of the water level in the Hanford Reach so that the *R. columbiae* habitat is exposed later in the season. The species is now subject to a growing season that is probably shorter and wetter than it had been before the dams were operational.

Rorippa columbiae appears adaptable to substrate disturbance. Before the presence of dams, spring floods probably scoured the river banks and sand bars. Disturbances were also common at the Hanford Townsite (Figure 1), an active farming community. During construction in the 1940's and 50's, considerable waste concrete, metal and other rubbish were dumped along the banks of the river. *Rorippa columbiae* is found today wherever suitable habitat exists—even among pieces of waste concrete.

A study of the limited herbarium material suggested that this species may be divided morphologically into three geographically separated variants. The plants

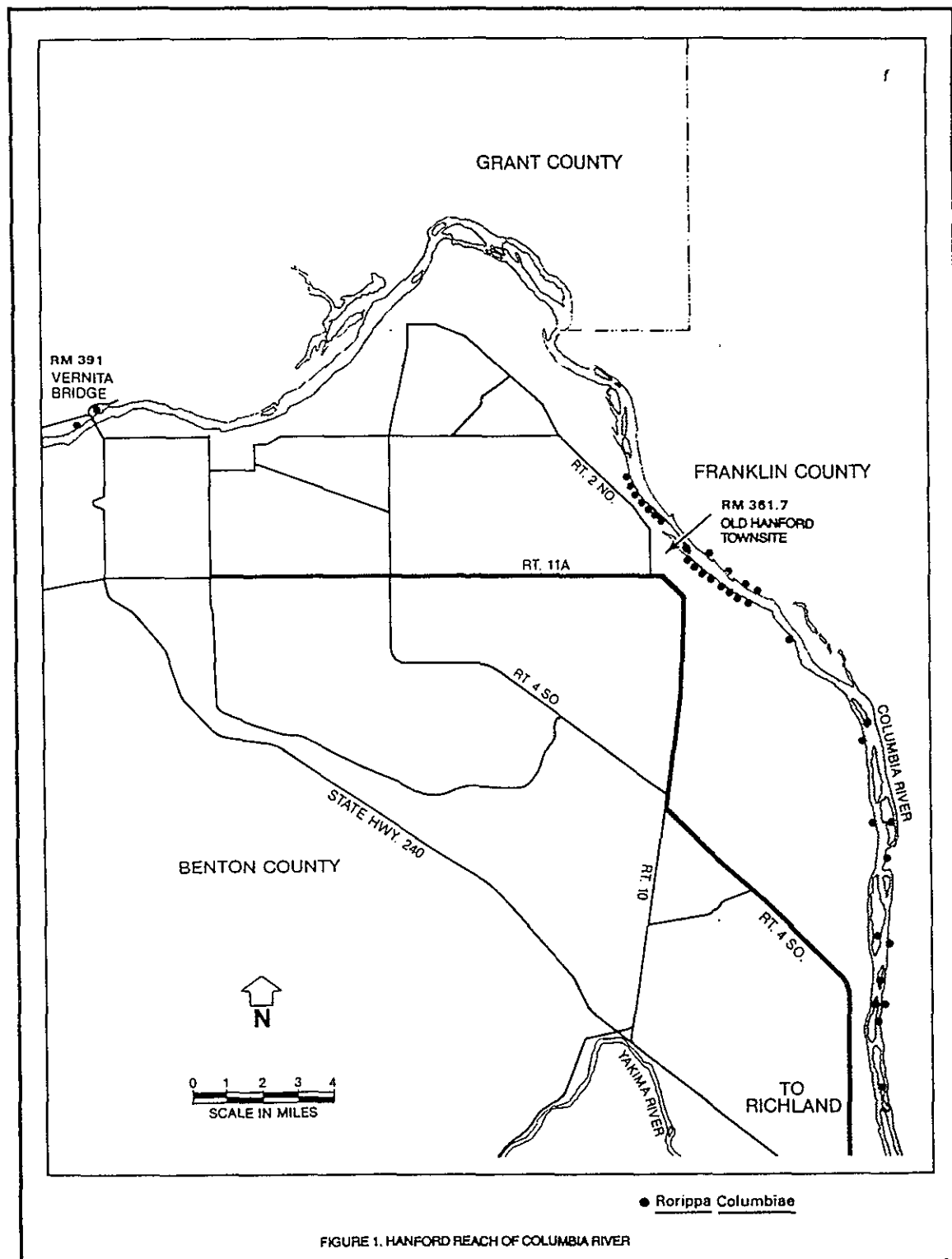


Figure 1. Hanford Reach of Columbia River. The dots indicate locations where yellowcress was growing.

along the Hanford Reach of the Columbia River and the Bingen collection are uniform in appearance, typically decumbent, with stems less than 30 cm long. In contrast, the single specimen from Lava Beds National Monument, collected

in 1936, is an erect, freely branched plant, spherical in habit, and approximately 30 cm in diameter and height. The material from the lakes in south central Oregon (Silver Lake, Swan Lake, and 10 miles west of Klamath Falls) is uniform in appearance, more or less decumbent, and intermediate in size and habit between the Columbia River and Lava Beds material. These characteristics are distinct enough that a casual observer can easily separate the specimens into the three groups: Lava Beds National Monument, south central Oregon, and Columbia River. We must immediately caution, however, that these observations are based on only a few collections (only one from Lava Beds National Monument) and that a careful study of a statistically valid number of plants is needed.

Our observations, together with the information from herbarium labels on known collections, indicate that *R. columbiae* occupies moist soil at the edge of a body of water except at Lava Beds National Monument in California. Here, according to the label, it occurs on lava slopes. However, it is likely that the single specimen from that area was collected on the shore of Tule Lake, which in 1936 when the specimen was collected, was within the boundaries of the Monument (Gary Hathaway, Lava Beds National Monument, personal communication). As with the morphological variation, we must caution that more studies are essential to confirm that *R. columbiae* is extant at previously collected sites and that its habitat is uniform throughout its range.

The species offers some interesting opportunities for detailed studies. Stuckey (1972) has suggested that the species may be very old and that the present distribution is relictual. If this is true, the geographic isolation between the Columbia River site(s) (Bingen *R. columbiae* may not presently exist) and the Oregon-California sites may be sufficient to have allowed divergent evolution to cause observable difference between these populations. To test this hypothesis would require collecting and propagating material from all sites and crossing the plants to obtain data on chromosomal compatibility between plants of the several sites. Chromosomal abnormalities such as rings or chains in the crosses would suggest that the specific status of the group was in question and that more consideration should be given to the preservation of a particular population because the "species" would not be as widespread as first thought.

Such studies on the distribution, morphology, cytogenetics, and ecology of *R. columbiae* are needed to accurately define the extent of vulnerability of this species. However, these studies are not necessary to document the abundance or uniformity of *R. columbiae* on the Hanford Reach of the Columbia River.

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